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CONCENTRATION IN PIG-IRON AND COAL PRODUCTION.

BY E. W. PARKER.

A few weeks since, in response to a request of a correspondent, I compiled a statement showing to what an extent the manufacture of pig-iron is following the tendency of many other industrial enterprises,— that is, concentration in the hands of comparatively few large concerns, and thus resulting in the freezing out or absorption of the individual producers and smaller corporations. The results of my investigations show some very interesting facts. My information was gathered from the files of the *American Manufacturer* at Pittsburg, in which city I happened to be at the time. The *American Manufacturer* publishes once a month a statement of the condition of the blast furnaces in the United States during the preceding month, the statements being compiled from direct returns of the producers. These show the number of furnaces in blast — charcoal, anthracite and bituminous, and coke — with the total weekly capacity of each. My investigations extended back only as far as 1890, and the results are shown in the accompanying tables. In January, 1890, the total number of furnaces in blast was 345, with a total weekly capacity of 175,002 tons of pig-iron, or an average weekly capacity per furnace of 507 tons. In January,

1898, the total number of furnaces in blast was 190, with a total weekly capacity of 227,979 tons of pig-iron, an average weekly capacity per furnace of 1252.5 tons. Observe that the number of furnaces in blast has decreased from 345 to 190, a difference of 155, the number of furnaces in blast in January, 1898, being only 55 per cent of the number in blast in January, 1890. The total weekly capacity, however, has increased from 175,000 tons to 228,000 tons, a gain of 30 per cent, while the average individual capacity increasing from 507 tons to 1252.5 tons shows that the average output per furnace in January, 1898, was two and one-half times what it was in 1890. The development of these conditions since 1890 has been remarkably regular and persistent. In January, 1890, the average capacity per furnace was, as stated, 507 tons. In the opening months of the succeeding years it was as follows: 1891, 537 tons; 1892, 618 tons; 1893, 703 tons; 1894, 780 tons; 1895, 933 tons; 1896, 981 tons; 1897, 1022 tons. In July, 1897, it was 1165 tons; in November, 1897, 1187 tons, and reaches its highest figure in January, 1898, with 1252.5 tons. The decrease in the number of furnaces in blast has not been so regular, but at no time since 1890 has the number been so large as it was in that year. In January, 1894, the number of furnaces in blast was only 132, while in July of the same year the number had fallen to 111, the average capacity per furnace being 780 tons at both periods. This was a year of great depression in the iron industry, following the panic of 1893, and the production of pig-iron amounted to only 6,657,388 tons, the smallest output in the period under review, being but little more than two-thirds of the production in either 1890 or 1897. In January, 1896, the number of furnaces in blast was 240, the capacity being 981 tons per furnace. The first half of this year (1896) was one of great activity, the production in the first six months being larger than in any other similar period with the exception of the latter halves of 1895 and 1897. In July of 1896 the number of furnaces in blast had decreased

to 191, again to 160 in January, 1897, to 143 in July, increasing with the industrial revival of the latter part of 1897 to 185 in November, and 190 in January, 1898.

Considering the same proposition according to the kinds of fuels used, we find that the number of charcoal furnaces has decreased from 66 in January, 1890, to 15 in January, 1898, less than one-fourth. (In December, 1897, there were 21 charcoal furnaces in blast.) The total weekly capacity has declined from 12,693 tons in 1890 to 4725, showing the production of charcoal iron in January, 1898, to be little more than one-third of what it was in 1890; but when we consider the average capacity per furnace we find the same rule obtains as for the total. In January, 1890, the average capacity per furnace was 192 tons per week, while in January, 1898, it was 315 tons, an increase in individual capacity of 64 per cent. Among the anthracite furnaces there has also been a decrease in production, the total capacity in January, 1890, being 41,954 tons, while last January it was 20,669 tons, less than one-half. The number of furnaces in blast has decreased from 111 in January, 1890, to 29 in 1898, a difference of 82, or 74 per cent. But here again in spite of these decreases we find a large increase in the average capacity per furnace. In 1890 the average weekly capacity per furnace was 378; in 1898 it is 713, an increase of 88 per cent.

The proportion of decrease in the number of furnaces using bituminous coal and coke has been less than in the others. Against 168 furnaces in blast in January, 1890, we have 146 in blast in January, 1898. But in this line we see no decrease in the total weekly capacity. On the other hand, the total weekly capacity has increased from 120,345 tons to 202,585 tons, a gain of about 66⅔ per cent, while the average capacity per furnace has increased from 716 tons to 1388, nearly double.

It is interesting to note in connection with this that there are only two important iron-producing districts in which

there has been an increase in the number of furnaces in blast in the eight years under review. In the Illinois, Missouri, and Wisconsin district there were 16 furnaces in blast in 1890, and 19 in 1898, a gain of three. There have been as many as 21 in January, 1896, while in January, 1894, there was but one. In the Pittsburg or Allegheny county (Penn.) district, the most important one in the country, there was a gain of eight, from 21 in 1890 to 29 in 1898. In December, 1897, there were 30 furnaces in blast. The lowest number was 16 in July, 1894. In the Shenango Valley, Pa., there were 16 in 1890, and 11 in 1898, a loss of 5. In the —

	1890.	1898.	Loss.
Juniata and Conemaugh Valleys, Pa.	13	7	6
Virginia and Maryland	12	10	2
Mahoning Valley, Ohio	13	10	3
Eastern, Central, and Northern Ohio	14	14	0
Tennessee and Kentucky	13	10	3
Georgia and Alabama	23	18	5

In regard to the average weekly capacity of the furnaces in these districts we find that there have been the following changes: —

	1890.	1898.	Per cent of Increase.
Allegheny County	1,130	1,982	75
Shenango Valley	701	1,522	117
Juniata and Conemaugh Valleys	466	1,325	184
Virginia and Maryland	609	824	35
Mahoning Valley	841	1,515	80
Eastern, Central, and Northern Ohio	803	1,391	73
Tennessee and Kentucky	423	663	57
Georgia and Alabama	600	1,112	85
Illinois, Wisconsin, and Missouri	991	1,691	71

In not one of the districts does the total productive capacity show a decrease. In the Allegheny county district the total capacity increased from 23,731 tons to 57,461; Shenango Valley from 11,223 to 16,738 tons; Juniata and Conemaugh Valleys from 6055 to 7949; Virginia and Maryland from 7309 to 8242; Mahoning Valley from 10,938 to 15,150; Eastern, Central, and Northern Ohio from 11,250 to 22,250; Tennessee and Kentucky from 5497 to 6634; Georgia and Alabama from 13,814 to 20,009; Illinois, Wisconsin, and Missouri from 15,854 to 32,134.

As to whether this increased productive capacity has been the result of or the cause of the lower prices of iron and steel, and the manufactures thereof, I shall not attempt to say. That they have attended each other is true. In 1890 the average price of No. 1X foundry pig-iron in Philadelphia was $18.40 per ton. Ten years before it was $28.50. In 1870 it was not far from $50. (In 1872 it was $48.88.) In February, 1898, the price of this grade of pig-iron in Philadelphia is quoted at $12 to $12.25.

According to Mr. James Gayley of the Carnegie Steel Co. this increased individual furnace capacity has been the result of several causes. First may be mentioned an increased diameter of hearth; second, a greater depth of hearth, so that more carbon could be burned below the tuyeres; third, improved blowing machinery and an increased number of tuyeres, all of which may be summed up as providing means for a more rapid combustion of the carbon in the hearth of the furnace, as on this depends the product of the furnace.

Mr. John Fulton, of Johnstown, adds a fourth cause — an increase in the heat of the blast. Mr. Gayley states that there have been some changes made in the hot-blast stoves, but he is not convinced in his own mind that the changes are improvements. These improvements of hearth, blast, and tuyeres have done more than increase the capacity of the furnace. A no inconsiderable item in the economies resulting from improved furnace practise is the reduction in the amount of fuel consumed. In 1890 one ton of pig-iron with 2000 pounds of coke (equivalent to one and one-half tons of coal) was considered good work. A good furnace today will use only 1800 pounds of coke, per ton of pig, showing that a saving of 10 per cent has been effected in the fuel.

There are two other factors which have had an important bearing on the increased capacity of the blast furnaces and the lowering of the cost of production; one is the protecting of the bosh walls of the furnace with bronze bosh cooling

plates, thus protecting the walls at this point, resulting in prolonging the youth of the furnace, and maintaining the output far beyond a period when formerly furnaces were blown out for repairs. Mr. Gayley claims that the use of these bosh plates reduces the fuel consumption. Finally, we must take into consideration the improved mechanical appliances for handling the furnace charge. These have been made necessary by the larger capacity and output, and have followed the other changes.

Having this history of the iron industry before me, I have compiled from the records of the Geological Survey a statement in regard to the production of coal. My object was to see how far, if at all, coal mining had shown a similar tendency. My investigation covered the six years from 1891 to 1896, inclusive. I took for consideration the output of bituminous coal mines, producing (1) less than 10,000 tons per annum, (2) from 10,000 to 50,000 tons, and (3) over 50,000 tons. The figures show that the proportion produced by the smaller mines remained practically constant at 4 per cent of the total, the middle class varied from 16 to 21 per cent, being 17 per cent in 1891 and 16 per cent in 1896, while the larger class varied from 74 to 80 per cent, being 79 per cent in 1891 and 80 per cent in 1896.

If the coal mining interests have not as yet shown the same degree of consolidation, indications unmistakably point to this result. The prices of both anthracite and bituminous coals have been showing a declining tendency for several years. In 1887 the general average price of bituminous coal was $1.12 per ton of 2000 pounds. In 1888 and 1889 it was $1.00. During the next three years it was 99 cents, falling to 96 cents in 1893, to 91 cents in 1894, to 86 cents in 1895, and reaching the lowest notch, 83 cents in 1896. This is a decline of 27 per cent in 9 years. The statistics for 1897 are not sufficiently advanced to be able to state what the average price was for the year. It is possible that the two months' strike may have resulted in an advance in value

for the time that will show an improvement in the price, but this should not be taken as an indication of better conditons. Since 1887 and to the close of 1896 there was not a single reaction against the declining tendency in the bituminous coal trade. Anthracite prices declined from $2.01 per short ton in 1887 to $1.43 in 1890. Restricted production in the anthracite region in 1892 and 1893 brought the prices up to $1.57 and $1.59, respectively, while an output in excess of demand in 1985 reduced the price to $1.41 per short ton, this figure being obtained by dividing the total value by the total product including colliery consumption. Anthracite is, however, always sold at the mines by the long ton of 2240 pounds. Excluding the item of colliery consumption, the average price for all coal marketed in 1895 was $1.72 per long ton. This figure represented a net loss of 8.1 cents on every ton of coal mined by the Philadelphia & Reading Coal & Iron Co., approximately $1,000,000, while the Lehigh Valley Coal Co. lost 13.48 cents on every ton of coal mined and purchased. The anthracite operators got together in 1896, restricted production and put the price up to $1.85 per long ton at the mines. The shipments from the anthracite region in 1896 amounted to 43,177,485 long tons. The estimated domestic consumption was 42,344,222 tons, the exports, 1,350,000 tons, making a total of about 43,695,000 tons, the deficiency being made up by stocks carried forward from 1895. The estimate made by the Anthracite Coal Operators' Association, of domestic consumption in 1897, puts the figures at 38,159,000, — the exports approximately were 1,300,000 tons, making a total, say, of 39,460,000 tons. The shipments from the region during the year were about 41,200,000 tons, making a surplus of production over consumption and exports of over 1,700,000 tons*. It is the surplus that demoralizes prices, and we

* Since the above was written the returns to the Geological Survey show that the shipments of anthracite coal in 1897 amounted to a little over 41,600,000, so that the surplus would be 2,100,000 tons. There was not, however, any decline in the selling price of anthracite as compared with 1896. The price per long ton, considering all marketable sizes, was $1.85 in both years.

shall doubtless see, when the returns for 1897 are all in, that lower prices for coal, causing in turn a reduction of wages among the miners, were responsible for the deplorable affair at Hazelton last summer. Bituminous coal operators are between two fires,— a strong mine workers' union on the one hand, demanding and receiving higher remuneration, and surplus production and falling prices on the other. In the light of present knowledge it is hard to see how any relief is to be obtained unless advantage is taken of the economies in operation, which can only be effected by increased production at larger plants and the closing down of smaller mines.

TOTAL NUMBER OF CHARCOAL, ANTHRACITE, AND COKE FURNACES IN
WEEKLY CAPACITY ON THE DATES

Date.	Charcoal.			Anthracite and Coke.		
	No. Furnaces in Blast.	Total Weekly Capacity.	Average Weekly Capacity.	No. Furnaces in Blast.	Total Weekly Capacity.	Averag Weekl Capacit
Jan. 1, 1898..	15	4,725	315	29	20,669	713
July 1, 1897..	15	3,282	219	26	18,913	727
Jan. 1, 1897..	21	6,356	302	32	19,525	610
July 1, 1896..	26	7,686	295	39	25,812	662
Jan. 1, 1896..	21	5,379	256	59	39,714	673
July 1, 1895..	16	3,584	224	38	20,847	549
Jan. 1, 1895..	24	5,395	225	37	21,182	572
July 1, 1894..	24	4,016	167	30	12,972	432
Jan. 1, 1894..	19	3,759	198	30	15,303	510
July 1, 1893..	37	8,268	223	65	28,463	438
Jan. 1, 1893..	40	9,045	226	70	31,167	445
July 1, 1892..	43	10,358	241	74	32,075	433
Jan. 1, 1892..	56	12,448	222	93	39,631	426
July 1, 1891..	51	10,589	208	92	35,977	391
Jan. 1, 1891..	61	12,459	204	102	41,952	411
July 1, 1890..	62	13,234	213	114	45,038	395
Jan. 1, 1890..	66	12,693	192	111	41,954	378

NUMBER OF FURNACES IN BLAST AND THEIR TOTAL AND AVERAGE WEEKL

Date.	Allegheny County, Pa.			Shenango Valley, Pa.			Juniata and Conemaugh Valleys, Pa.			Virginia and Maryland.			M
	Number of Furnaces in Blast.	Total Weekly Capacity.	Average Weekly Capacity Per Furnace.	Number of Furnaces in Blast.	Total Weekly Capacity.	Average Weekly Capacity Per Furnace.	Number of Furnaces in Blast.	Total Weekly Capacity.	Average Weekly Capacity Per Furnace.	Number of Furnaces in Blast.	Total Weekly Capacity.	Average Weekly Capacity Per Furnace.	Number of Furnaces in Blast.
Jan. 1, 1898..	29	57,461	1,982	11	16,738	1,522	6	7,949	1,325	10	8,242	824	10
July 1, 1897..	25	50,992	2,039	4	5,944	1,486	6	7,011	1,168	11	10,151	923	4
Jan. 1, 1897..	23	47,118	2,048	5	7,459	1,492	6	6,018	1,003	11	9,255	841	8
July 1, 1896..	21	41,460	1,974	9	13,201	1,467	10	11,189	1,119	11	9,768	888	6
Jan. 1, 1896..	23	43,592	1,895	11	12,210	1,110	11	11,637	1,058	18	13,011	723	11
July 1, 1895..	24	39,026	1,626	14	15,823	1,130	7	7,104	1,015	10	5,416	542	9
Jan. 1, 1895..	24	41,815	1,742	15	17,108	1,141	8	9,444	1,180	9	5,803	645	8
July 1, 1894..	16	28,525	1,783	0	0	0	1	250	250	8	4,869	609	0
Jan. 1, 1894..	18	29,997	1,667	9	9,250	1,028	6	5,025	838	11	7,633	694	4
July 1, 1893..	23	36,342	1,580	11	10,959	996	10	8,156	816	12	9,577	798	8
Jan. 1, 1893..	23	36,278	1,577	8	8,692	1,087	10	7,794	779	15	10,100	673	10
July 1, 1892..	23	34,389	1,495	6	5,780	964	9	6,059	673	14	8,597	614	9
Jan. 1, 1892..	21	31,597	1,505	14	12,840	917	13	7,881	606	15	9,489	633	10
July 1, 1891..	24	31,753	1,323	15	12,384	826	11	5,665	515	13	8,316	640	11
Jan. 1, 1891..	22	29,141	1,325	11	7,791	708	12	6,248	521	13	7,804	600	8
July 1, 1890..	20	25,064	1,253	17	12,770	751	12	6,004	500	13	8,188	630	12
Jan. 1, 1890..	21	23,731	1,130	16	11,223	701	13	6,055	466	12	7,309	609	13

T FURNACE CAPACITY.

ES IN BLAST IN THE UNITED STATES, AND THEIR TOTAL AND AVERAGE ATES NAMED. (TONS, 2240 POUNDS.)

e.	Bituminous and Coke.			Total.		
Average Weekly apacity.	No. Furnaces in Blast.	Total Weekly Capacity.	Average Weekly Capacity.	No. Furnaces in Blast.	Total Weekly Capacity.	Average Weekly Capacity.
713	146	202,585	1,388	190	227,479	1,252
727	102	144,363	1,415	143	166,558	1,165
610	107	137,695	1,287	160	163,576	1,022
662	126	165,437	1,313	191	198,935	1,046
673	160	190,287	1,189	240	235,380	981
549	133	140,448	1,056	187	164,879	882
572	127	148,800	1,172	188	175,377	933
432	57	69,541	1,220	111	86,529	780
510	83	83,937	1,011	132	102,999	780
438	128	124,221	970	230	160,952	700
445	140	135,489	968	250	175,701	703
433	140	127,417	910	257	169,850	661
426	161	139,363	866	310	191,442	618
391	154	120,858	785	297	167,424	564
411	143	109,870	768	306	164,281	537
395	164	120,423	734	340	178,695	526
378	168	120,345	716	345	175,002	507

EEKLY CAPACITY IN THE FOLLOWING DISTRICTS ON THE DATES NAMED.

	Mahoning Valley, Ohio.			Eastern, Central, and Northern Ohio.			Tennessee and Kentucky.			Georgia and Alabama.			Illinois, Missouri, and Wisconsin.		
Furnace.	Number of Furnaces in Blast.	Total Weekly Capacity.	Weekly Capacity Per Furnace.	Number of Furnaces in Blast.	Total Weekly Capacity.	Weekly Capacity Per Furnace.	Number of Furnaces in Blast.	Total Weekly Capacity.	Weekly Capacity Per Furnace.	Number of Furnaces in Blast.	Total Weekly Capacity.	Weekly Capacity Per Furnace.	Number of Furnaces in Blast.	Total Weekly Capacity.	Weekly Capacity Per Furnace.
4	10	15,150	1,515	16	22,250	1,391	10	6,634	663	18	20,009	1,112	19	32,234	1,697
3	4	5,873	1,468	9	12,026	1,336	7	5,593	799	15	16,837	1,122	11	20,255	1,841
1	8	11,861	1,483	8	9,730	1,216	8	5,256	669	15	17,471	1,165	8	11,825	1,478
3	6	8,382	1,397	12	15,499	1,292	9	7,397	822	17	18,936	1,114	15	26,681	1,779
2	11	14,276	1,298	15	20,113	1,341	12	9,003	750	20	19,625	981	21	32,960	1,570
2	9	10,068	1,119	12	11,756	980	8	5,166	646	18	17,667	982	14	18,347	1,311
5	8	9,636	1,204	13	14,919	1,148	7	4,977	711	15	14,911	994	12	20,018	1,668
0	0	0	0	4	6,387	1,597	5	3,641	728	9	8,282	920	7	12,986	1,855
1	4	4,544	1,136	7	6,746	964	7	3,156	451	12	11,534	961	1	619	619
1	8	9,122	1,140	12	10,785	899	8	4,313	539	18	13,385	744	8	12,223	1,528
1	10	10,482	1,048	12	11,574	965	9	5,285	587	21	15,794	752	13	17,430	1,341
1	9	8,607	956	13	11,453	881	9	5,409	601	24	15,927	664	14	21,442	1,538
1	10	9,908	991	13	11,594	892	12	5,572	464	26	17,987	692	17	21,391	1,250
1	11	9,227	839	11	9,146	831	11	5,254	477	23	15,214	661	13	14,404	1,108
1	8	6,786	849	15	12,866	858	12	5,627	469	14	9,309	665	14	15,367	1,098
1	12	9,943	829	13	10,028	771	10	4,182	418	28	16,711	597	17	17,062	1,004
1	13	10,938	841	14	11,250	803	13	5,497	423	23	13,814	600	16	15,854	991

THE ANNUAL STATISTICS OF MANUFACTURES IN MASSACHUSETTS.

By Horace G. Wadlin.

A paper has recently been published by my friend, Mr. North, developing a line of argument offered by him before the Committee on the Census of the United States Senate, in which he forcibly takes issue with a proposed plan for obtaining, biennially, statistics of manufactures in the United States, which had been presented to the committee by Hon. Carroll D. Wright. With Mr. North's main contention I have nothing to do. The plan which he was opposing has, I believe, been modified. But in the course of his argument he makes certain criticisms upon the annual statistics of manufactures, as taken in Massachusetts, which seem to me unwarranted.

Let me say, at the outset, that I do not think the proposed enlargement of the official statistics at Washington which he was opposing is necessarily justified by the success of a similar plan within the compact State of Massachusetts; nor, on the other hand, do I think it essential to his argument to allege the failure of the plan in Massachusetts. I am particularly interested in the progress of statistical work in this State, however, and of this work I believe, and hope to show, that the annual statistics of manufactures are an important part. The subject is germane to the purposes of this Association, and therefore, in no spirit of controversy, I have the honor to present this paper.

A standard is set up by which the annual statistics may be tried. This standard is the census, and it is assumed that only a census, that is, a complete return from all establishments of every kind, can show industrial conditions in general; and as the annual statistics do not include all the establishments which have heretofore been included in the

census, it therefore follows that they cannot measure such conditions. The standard proposed may be accepted, but not the assumption. On the contrary, I propose to compare the annual statistics with the census, and by this comparison to show their accuracy.

The measurement of growth or decline in our industries is one of the principal uses of the census. Now, if the census affords a correct measure, and we find that the annual statistics agree substantially with it, then the contention that the annual statistics are of equal value as a measure is sustained. Exact agreement, of course, is not expected. No two censuses taken at the same time over the same territory would absolutely agree. But I ought to show, and will show, that there is no material disagreement between the results obtained in the annual statistics and in the census of manufactures taken either by the Commonwealth or by the United States.

The Massachusetts census of 1895 shows an increase since 1885 in the aggregate value of goods made, amounting to 25.97 per cent. Computing the growth for 10 years on the basis of the annual percentages of growth or decline shown from year to year in the annual statistics of manufactures, we arrive at a percentage of 28.35. This is a variation of 2.38 per cent in a period of 10 years, or not more than twenty-four one-hundredths of one per cent per year, upon the average.

Again, taking the establishments which made returns for annual statistics in 1895 and selecting the returns of the corresponding establishments for 1885, and determining the percentage of increase from them alone, we have a percentage of 26.42* as against 25.97 shown in the census, a variation of forty-five one-hundredths of one per cent only.

Still again, taking the total value of goods made, as shown in 1895 as against the amount shown in 1890 by the United States Census, we find a percentage of decline amounting to 4.32. The percentage of decline shown by the annual sta-

* *Statistics of Manufactures*, 1895, Introduction, p. xxi.

tistics of manufactures, based upon identical establishments for which returns are comparable, is 4.60; a variation of twenty-eight one-hundredths of one per cent.

The increase in wages paid in 1895 as compared with 1885, by the data drawn from the annual statistics, was 34.95 per cent, and, as finally determined by the census, 30.90 per cent; showing a variation of but 4.05 per cent in an aggregate of nearly $200,000,000. The increase in stock used, by data from the annual statistics, was 22.80 per cent, and by the census, 18.34 per cent; a variation of 4.46 per cent in an aggregate of about $460,000,000.

In other words, if we had taken no census but had relied upon the annual statistics, the sum of wages paid in 1895 would have been placed at $198,936,969; and the census returns aggregate $192,970,059. As to stock used, the aggregate estimated from the annual statistics is $478,622,158; and by the census it was found to be $461,254,353. As to output, the estimate from the annual statistics is $852,872,643; and the actual census aggregate $849,807,302. Do not these comparisons establish the validity of the annual statistics as a basis for judging of the increase in the different elements?

By means of the percentages of gain shown in the annual statistics for 1890 and 1885, and using the State census figures of 1885 as a base, we estimated, nearly one year in advance of the publication of the actual census returns, the output for 1890 in Massachusetts at $880,614,364. The figures of the Eleventh United States Census, when published, showed $888,160,403; a variation of less than nine-tenths of one per cent.

In order to compare the results indicated by the annual statistics with the returns of the Eleventh United States Census for the leading industries in Massachusetts certain differences in classification must first be eliminated. In the classification employed in the annual statistics, following the plan adopted in the State census, the cotton industry is

shown in two divisions, namely, "cotton goods," and "print works, dye works, and bleacheries," which should be combined in order to parallel the United States Census classification; and, on the other hand, with the value of "cotton goods" as returned in the United States Census should be combined the added value placed upon cotton fabrics in print works, dye works, and bleacheries in order to bring the industry into harmony with the items combined in Massachusetts.

The items "cotton, woollen, and other textiles," "mixed textiles," "worsted goods," and "woollen goods" as presented separately in the Massachusetts reports should be combined in order to parallel the aggregate woollen goods product of the Eleventh Census; and the item "wool hats" should be excluded from the census figures, as these are not included with woollen goods in the classification adopted in Massachusetts. From the value of "silk goods" presented in the United States Census the item "dress trimmings" must be excluded for the same reason. Some slight differences of classification may possibly still remain, but after the readjustments mentioned have been made, the figures will be fairly comparable, and for the State census of 1885 are as follows: —

Wool products *	$50,861,392
Cotton products †	77,305,940
Carpetings ‡	5,992,668
Silk goods §	3,501,240
Aggregate, combined textiles	$137,661,240

In order to test the validity of the annual statistics as a measure of growth as compared with the census we may estimate the product of 1890 by applying to each of these totals the percentages of increase derived from the annual report. The results of this computation are presented in the following table in comparison with the figures from the Eleventh U. S. Census, and the variation noted: —

* Excluding carpets separately presented) and wool hats.
† Including print works, dye works, and bleacheries.
‡ Textile carpets only.
§ Excluding dress trimmings.

COMBINED TEXTILES — 1890.

Classification.	Estimated Product from Annual Statistics.	Product from Eleventh U. S. Census.	Variation. Gain (+) or Loss (—) in Annual Statistics.	Percentage of Gain (+) or Loss (—) in Annual Statistics.
Wool products *	$61,699,888	$63,976,966	— $2,277,078	— 3.56
Cotton products †	112,696,302	110,537,767	+ 2,158,535	+ 1.95
Carpetings ‡	7,495,100	7,275,009	+ 220,091	+ 3.03
Silk goods §	5,004,672	5,397,569	— 392,897	— 7.28
Total	$186,895,962	$187,187,311	— $291,349	— 0.16

* Excluding carpets (separately presented) and wool hats.
† Including dyeing and finishing textiles, added values.
‡ Textile carpets only.
§ Excluding dress trimmings.

In the aggregate, the value of product of the textile industry in Massachusetts for 1890, as estimated from the data derived from the annual statistics, was $186,895,962; the census returns show $187,187,311, a variation of $291,349, the estimate based on the annual statistics being sixteen one-hundredths of one per cent too small. The variations in the items shown separately in the table are greater than that shown in the aggregate, but, except with respect to silk goods, are in no case very great upon the percentage basis. In silk goods the variation is 7.28 per cent, partly due to differences in classification impossible to eliminate; but the product varies but $392,897, being on the one hand $5,397,569, and on the other $5,004,672.

We may apply the same test to two other leading industries of the State, namely, boots and shoes and paper. The total product of the first in 1885 was $114,729,533, and of the other $21,223,626. Applying to each the percentages of increase shown in 1890, as compared with 1885 by the annual statistics, we obtain the following estimates of product for 1890: Boots and shoes,* $135,954,497; paper,† $26,319,419. The United States Census figures are, respectively, $137,588,047

* Includes cut stock, findings, uppers, custom work and repairing, and factory product.
† Includes paper, envelopes, paper goods and stationery goods, not otherwise specified.

and $26,453,085. The variation is 1.19 per cent in boots and shoes, and fifty-one one-hundredths of one per cent in paper.

If, then, the census is set up as an accurate measure of the growth of the industries, as indicated by output, and the measurement of growth afforded by the annual statistics shows no material variation from that of the census, is it not certain that the annual statistics may be accepted as equally accurate?

These comparisons sufficiently show that the reports are not misleading, but that, on the contrary, they afford an exact basis of judgment; and therefore that the percentages drawn from them may be accepted as measuring the different elements relating to production.

The reason for this substantial agreement between the annual statistics, which include only a limited number of establishments, and the census, which aims to include them all, is not far to seek. It has been several times fully shown, but may now be repeated.

In the census of 1885, for example, the total product returned was $674,634,269. Of this product, goods to the value of $631,822,681, or 93.65 per cent, were turned out in only 6757 establishments, and in each of the other establishments, which swelled the aggregate number to 23,431, the value of goods made amounted to less than $10,000. Further, 88.96 per cent of the total product was made in 4406 establishments. In other words, the returns from 4406 establishments would represent 88.96 per cent of the total value of goods made as returned in the census; and if returns were secured from 6,757 establishments we should then cover 93.65 per cent of the industrial output of the State.

We should not only cover this large proportion of the output, but also include a correspondingly large proportion of the persons employed, wages paid, and stock used. And it is also certain that the inclusion of the other establishments would not materially change the relations of the

different elements to one another, as expressed in percentages, or materially alter any deductions respecting our industrial conditions which are likely to be drawn from the returns. It is true that the conditions obtaining in the excluded establishments alone could not thus be measured, but, if these excluded establishments were included, it would not, I repeat, change in any material degree the relations of the different elements to one another, or affect any important deduction which could be made as to the condition of our industries as a whole.

If the establishments are graded in three classes,— low, medium, and high, classing as low, establishments in which the value of annual product, as returned in 1885, was less than $40,000; as medium, those returning an annual product of $40,000 but under $150,000; and as high, those returning an annual product value of $150,000 or more, it will be found that the percentages of increase in each grade vary; but, if the different industries are examined in detail, it will be seen that a practical uniformity exists in the percentages of increase in the medium and high grades, while those in the low grade exhibit a considerable variation. That fact is brought out by the census, and it is an important fact. But, if the returns from the medium and high-grade establishments only are taken, the percentage of increase derived from them is not materially different from that obtained when all the establishments are included. For example, the increase in 1890, as compared with 1885 in all establishments, was 27.70 per cent, and the percentage derived from the medium and high-grade establishments only was 25.68.* That is, to repeat, returns from the establishments graded in these last two classes will measure very closely the condition of the industries as a whole. The inclusion of the comparatively large number of establishments of low grade does not materially change either the aggregate results or the results in the ten leading industries of the State; and for that reason

* *Statistics of Manufactures*, 1890, Introduction, p. xxi.

the returns obtained in the annual statistics are in substantial agreement with the results shown in the census.

It is not assumed that "the prosperity of the smaller establishments can be correctly inferred from the ascertained condition of the larger industries which are made to stand as typical." But it is clear that the condition of the industries as a whole, in Massachusetts, whatever may be the case as to the whole country, can be shown by returns from a number of establishments relatively small, but which include in the aggregate a product relatively large, as compared with the establishments and product usually included in the census.

The annual statistics are not confined to "the large, perfectly equipped and thoroughly organized establishments which run on from year to year, with little change in the output, piling up stock, or taking orders in advance of their capacity to manufacture." In fact, the large establishments fluctuate extremely from year to year, in their output, in their employés, and even in their capital, if by capital we mean the sum actually devoted to production. Some run more evenly than others, it is true; but the returns do not exclude the smaller establishments.

The distinction between the establishments included and excluded conforms approximately to that between strictly factory and shop industries. This line was roughly drawn in the State census of 1875 in the separation of the statistics of "manufactures" on the one hand, from those of "related occupations" on the other. In the State census of 1885 and subsequently, no such division was made, which largely accounts for the great increase in the number of establishments without a corresponding increase in product. The failure to observe this distinction complicates the collection of the data and the work of tabulation; enormously increasing the cost, and retarding the publication of the returns, without correspondingly extending the value of the census or materially adding to our stock of statistical information.

National censuses prior to 1880 excluded establishments having an output of less than $500 in the census year; yet of the large number of establishments returned in the State census of 1885, nine per cent were establishments of this kind, and nearly one-third of the whole number were establishments in which the aggregate product did not exceed $1500. Many of these establishments, like those included in the United States Census of 1890, were not in any usual sense of the word manufacturing establishments, although they were industrial establishments. They include large numbers of country carpenters, blacksmiths, wheelwrights, painters, plasterers, plumbers, milliners, and dressmakers, many of whom were working either by themselves or with but one or two employés. They include concerns operating under sidewalks, in cellars, lofts, and attics, without machinery, without capital, consuming little, if any, raw material, adding nothing important to product. They include bottlers, who simply take liquor in bulk, and, adding nothing, put it up in bottles with a new label. They include cobblers who do not make shoes but simply re-bottom them. They include, or at least did include, until omitted by Mr. Porter in the middle of the canvass of the Eleventh Census (a precedent followed by the Massachusetts census office in 1895), dentists, who do nothing but set artificial teeth in plates; — but it is not necessary to multiply instances. None of these, except by a special use of the term, would be called "manufacturing establishments," but have been thus classed in the Massachusetts Census of 1885 and in the Eleventh Census of the United States.

The results of the State Census of 1895 might have been published some months ago but for the inclusion of establishments like these, which we did not think it advisable to omit, inasmuch as they were previously included. But in presenting the results we shall endeavor to classify them separately, to an extent at least, so as to enable discrimination to be made in future censuses without disturbing comparisons with the past. Whether we have in the aggregate 26,923 estab-

lishments in Massachusetts, as reported in the Eleventh Census, or 23,431, as reported in the State Census of 1885, or a much smaller number, depends altogether upon how many concerns of this kind are included. After we pass the $10,000 limit of product we enter directly upon this field. All of these concerns have never yet been enumerated, and many of those included have no books of account, and therefore estimate the required items from more or less fragmentary data.

I find my opinion as to their exclusion from the census of manufactures supported by the late General Walker, when, in speaking of the defects of the census law, in the remarks on the tables of manufacturing industries in the Ninth Census, he states that fully one-fifth of the cost of the census had been expended for returns relating to such establishments, and even then the returns were extremely unsatisfactory. "The money thus thrown away," he says, "would have served . . . to make the statistics of the larger industries complete and correct in the highest attainable degree, creditable to the census as a national work, and invaluable to the statesman, the political economist, and the practical man of business. . . . In a word, *the returns of manufactures should be restricted to those industries which are carried on in considerable establishments, and are susceptible of a thorough, complete, and detailed enumeration.*"* Whether or not the census should be thus restricted, however, is not pertinent to our present inquiry. At all events, it is clear that, if it be thought advisable to include industrial establishments of the kind mentioned, if properly classified by themselves, they do not materially affect the results or change in any important degree the deductions that may be drawn from the census. So far as they affect results at all, they vitiate conclusions by introducing elements entirely dissimilar to those which exist in establishments of the other class.

The annual statistics include the establishments which employ the bulk of the operative classes. For example, the

* *Ninth Census of the U. S.*, vol. iii, pp. 384-385.

average number of persons employed in 1895, by the census, was 432,272; and the average number employed in 1895, by the establishments put into comparison for annual statistics for the years 1895 and 1896, was 307,590, or 71.16 per cent, nearly three-fourths of the average number in the State. A larger number was actually covered but not used in the comparisons because the establishments were not represented in each of the years. Nor do the annual statistics neglect the new establishments. On the contrary, they are carefully noted, and finally take their place in the yearly comparisons. As a matter of fact, I may state that the enumerators of the population as a part of their duty returned to the office a list of all establishments, of whatever kind, engaged in manufacturing, and only a comparatively small number of them had not been noted previously by the Department.

The validity of the annual statistics being established by the standard set up, namely, the Decennial Census (and other illustrations will be given later), it will, I think, be plain that they afford a basis for determining *present* conditions; that is, conditions in the different industries at the time the returns are made. They are not expected to measure conditions as they exist at the end of ten-year periods; that is the purpose of the census. But they do afford reliable data as to conditions from year to year; and, really, that is all that has ever been claimed for them. And I do not mean data relating merely to the increase or decrease of the industries, but as to all points for which we are otherwise obliged to rely upon the censuses taken at intervals of ten years. For, although, as I have said, the census is used as a measure of growth, it is also of value in the statistical determination of important social questions relating to employment, to wages, to the relative preponderance of the sexes in the industries, to the relation between wages and product, and to other subjects, some of which are purely social, some economic, and others economic-social, if I may use that term. The conditions affecting all these are continually changing

from year to year, making the annual statistics of special value because they reflect immediate conditions much more perfectly than the census.

It is perfectly true that individual manufacturers do not "predicate business operations upon statistics of this character;" but it is not a valid argument that such statistics are worthless to manufacturers because no individual can draw from them conclusions which bear directly upon his own operations, nor that a manufacturer, who may never have had occasion to use them personally, may think them worthless. Similar objections are sometimes urged against the collection of census statistics by those who, for the moment, are disinclined to take the trouble, usually much magnified in their minds, to fill the required schedule. But the annual statistics, equally with the census, have a direct practical value in connection with subjects that are constantly brought forward relating to the condition of our industries, involving inquiries which are frequently made by manufacturers upon matters relating to their interests, but which are by no means confined to manufacturers.

There is constant inquiry from the public, from legislators, from writers upon economic subjects, from students of economic questions, from persons employed in the different industries, from boards of trade interested in the growth of different localities in the State, from the press, from manufacturers seeking general information for *present* data respecting the industries. Information, for instance, may be requested as to wages or earnings. What is wanted are not wages or earnings six, eight, possibly nine, years ago, but present wages. How do they compare with output? What relation do they bear to persons employed? Suppose, for example, average yearly earnings are desired for the industries already referred to, and the question is asked in 1895,— what answer is afforded by the annual statistics?

It is given in the following table for the five leading industries in comparison with the figures from the census:—

AVERAGE YEARLY EARNINGS.

Industries.	Annual Statistics, 1895.	Census, 1895.
Cotton goods	$328.77	$330.24
Woollen goods	370.99	368.14
Worsted goods	365.17	363.52
Paper and paper goods	405.57	408.22
Boots and shoes	482.60	472.62

Note the correspondence of the figures. If the annual statistics are as trustworthy as the census in this year, why not in any other year?

Suppose, to carry the illustration in this direction still farther, we are passing through an industrial depression affecting output, employment, earnings; all of which topics are then of vital public interest. On these points, as affected by the conditions which then exist, the census affords no light. This deficiency can only be supplied by a return made at the time.

Suppose, too, that the census year happens to fall before the wave of depression has spent its force, and all the ten-year measurements of growth must be based upon returns taken in a year of great depression as against those made in a year of prosperity. Are not the deductions sure to be misleading? This, of course, is admitted, but the point is raised that the annual statistics afford no standard by which the effect of the depression may be measured. I think it is clear from what I have said that the fact is otherwise, and that the full effect of the depression, its relation to the normal output of our industries, its effect upon employment and wages, can be shown either graphically or by figures, and that thereby certain things, which, when the census of 1895 is published, would otherwise appear quite inexplicable, may be fully and fairly explained.

It is true that to an extent "its record is found in various trade data and in the reports of certain newspapers," but no complete statement as to any single industry can be made from such information however complete any part of it may

be in itself. The facts come from different sources; they have no direct relation to one another. Where, for instance, can we find, or from what source compile, any fair statement of the output of the different industries of Massachusetts during the present period? How determine the fluctuations of employment or the course of wages? I do not mean for particular industries, but over the whole field. Yet these are instances of the kind of information that is demanded. The condition of our industries is not shown in this way by newspaper reports, and if it were, no newspaper reports can take the place in validity and authority of official statistics, regularly collected and carefully analyzed.

And I think it is worth something historically to have authoritative data, showing the course of industrial conditions through a series of years, carefully compiled from original sources, upon substantially the same basis from year to year. The plan adopted in the reports upon the annual statistics is to compare the returns of two successive years, and to use in these comparisons only those returns which are made from identical establishments in each of the years compared. This makes it certain that the results will be drawn from returns made upon the same basis in year, and at least free from the introduction of dissimilar elements which so frequently tend to vitiate comparisons and render them misleading. This is a step toward accuracy at the source and must of itself make the results more trustworthy.

The returns thus afford data from year to year as definite and exact as the census returns themselves. They do not, it is true, give us exact numerical totals over the wide field covered by the census, although, as we have seen, such totals may be closely estimated from them; but for comparisons and relative statements or deductions based upon percentages they may be accepted without question; and it is this use of statistics that is most important. To say, for example, that there were 496,920 persons in Boston in 1895, as against 448,477 in 1890, does not of itself mean much; but to say that the increase has been 11 per cent, or a gain of 11 persons

upon every 100, within this period makes a distinct mental impression. To say, similarly, that the increase in the output of cotton goods in 1895, as against 1894, is 10 per cent is the important fact; the numbers upon which the percentages are based are comparatively unimportant. And if this and similar facts can be determined by the annual statistics within a reasonable degree of accuracy, they are, so far, as valuable as if determined from a census.

Take, as another illustration of what I mean, two or three of the more common statistical comparisons that are drawn from the census, such as the percentages of industry product (by which I mean the value of product created in the industry after deducting the value of stock and materials used) paid in wages, devoted to profit and other expenses, and the percentage which this last portion of product constitutes of capital invested. Such comparisons are made in the following table for the five leading industries in Massachusetts, the percentages derived from the annual statistics and from the census being placed in parallel columns: —

Industries.	Annual Statistics — 1895.			Census — 1895.		
	Percentages of Industry Product —		Percentage of Profit and Minor Expense Fund of Capital Invested.	Percentages of Industry Product —		Percentage of Profit and Minor Expense Fund of Capital Invested.
	Paid in Wages.	Devoted to Profit and Minor Expenses.		Paid in Wages.	Devoted to Profit and Minor Expenses.	
Cotton goods	60.49	39.51	14.76	60.75	39.25	15.04
Woollen goods	57.08	42.92	20.53	58.25	41.75	20.50
Worsted goods	60.15	39.85	18.95	60.06	39.94	19.13
Paper and paper goods	46.32	53.68	22.18	47.48	52.52	20.84
Boots and shoes	60.61	39.39	58.44	60.33	39.67	59.61

Here it will be seen that the results are in extremely close correspondence, showing, of course, that the small variations between the aggregates estimated from the annual statistics and those derived from the census do not affect such comparisons, because the variations in each of the

elements, *i. e.*, capital invested, stock used, goods made, and wages, have equal force, so that the conclusions as to the relation of wages to industry product or of the profit and expense fund to industry product, or of the latter to capital, are equally exact and are not materially different whether based upon the information derived from one source or the other.

The plan of basing conclusions upon a limited number of similar cases is by no means new, and, indeed, is universally accepted in statistical investigation. Witness, to take an important example, the crop return of the United States. The accuracy of the results does not depend upon the number of cases included, but upon the fact that the cases included are typical; and this is to be determined by the results when measured, if possible, by some absolute standard outside themselves, or by results obtained over the same field in a parallel investigation. In that way I have tested the annual statistics in Massachusetts. Such annual returns do not constitute a complete census. That claim has never been made for them. A census has its uses, obvious and established, which need not be enlarged upon here. They also have their uses, which I have sufficiently presented. Each method of inquiry supplements the other, corrects its defects, and enables us to make the necessary allowances that almost all statistical documents demand before their conclusions can be accepted. The annual statistics in Massachusetts have thus far abundantly shown their usefulness, and they are certain to improve. The returns of the last five years in many of the industries are much more exact and satisfactory than during the first five years, and they will inevitably gain in fullness and accuracy.

I should be sorry to be obliged to support every statement that may have appeared from time to time in these annual reports. Frequently statements seem warranted that subsequent investigation will not sustain. The work was new when undertaken in 1886, and it would be strange if some mistakes had not been made in plan and in arrangement.

Some industries, from the exigencies of the case, have been treated more fully than others, with correspondingly satisfactory results. During the first five years the boot and shoe industry did not receive the attention its importance demands, only about 33 per cent of its product having been covered. But since, with the greater efficiency resulting from permanance and experience, it has been brought up to the position of the other leading industries. Brevity of time, the pressure of other work in the Department, and due regard to economy have forced the office to compare a fewer number of schedules in some years than in others. These considerations have also influenced the date of publication of the reports, which, however, have gone out within a few months after the schedules were received from the manufacturers, except when the Department was burdened with the work of the Decennial Census, obliging us to delay publication. This, however, is rapid work, when it is borne in mind that the collection is not undertaken until after the close of the year, in order that the record of the previous twelve months may be fully made up in the establishments, and when the convenience of the manufacturer is consulted by the office, which has always proceeded upon the theory that no one should be harassed or unduly pressed in this matter.

The success of the reports has been largely due to the coöperation of the manufacturers who have, as a rule, cheerfully complied with the statute under which they are prepared, and the Department aims to reduce the labor or inconvenience of making the return as far as possible by simplifying and condensing the inquiries, and otherwise. If the manufacturers could file the schedule in the office by February 1st, the reports might be issued in April. But, as in the collection of census returns, considerable latitude must be given, and properly given, under the circumstances.

I regret the controversial tone this paper seems to assume in parts. I have neither time nor taste for controversy over figures; but I think it essential that the real value of the annual statistics of manufactures in Massachusetts should appear, and, I am sure, Mr. North desires nothing more.

Remarks by S. N. D. North.

By Mr. Wadlin's courtesy, I have had the privilege of examining his paper on the *Annual Statistics of Massachusetts*, in reply to certain criticisms incidentally made in the December (1897) *Bulletin of the National Association of Wool Manufacturers*. Like Mr. Wadlin, I have no desire to discuss the question in any controversial spirit; but both of us will welcome any discussion which may possibly promote the scientific value of the statistical work of the government, state or national. The importance of the question now raised is obvious; for if the plan of collecting annual statistics of manufactures in vogue in Massachusetts is as valuable and advantageous as Mr. Wadlin believes it to be, it should not only be extended to other states, but made the basis of a radical change in the methods of collecting and presenting this class of data. If, on the contrary, it seems open to serious criticism, the nature of that criticism should be carefully examined, and the practical utility of these annual reports definitely determined. To that end, I venture to make the following comments upon Mr. Wadlin's paper.

My original criticism upon the Massachusetts annual statistics was two fold; — first, that they do not afford an accurate standard by which to measure the industrial growth of a community or commonwealth; and, secondly, that, failing to do this, they do not accomplish any other practical purpose sufficient to warrant their constant compilation. Further study of the question, with Mr. Wadlin's paper before me, convinces me that both propositions are sound.

The last annual report of the Bureau of Statistics of Labor shows 4609 establishments covered for the year 1895, making goods to the value of $569,097,021; whereas the decennial census of that year, embracing presumably 26,000 establishments (Mr. Wadlin does not state the number), produced goods to the value of $849,807,302. In other words, by covering one-sixth of the establishments of the State, he secures two-thirds of the total product; and his contention is, that this is so large a proportion of the total product as to make the data presented a safe and correct criterion for judging the present condition of all the establishments of the State. We may concede, with certain limitations, the soundness of that contention, so far as it relates to the eight or nine leading industries. At the same time, I do not hesitate to affirm that a more satisfactory and a more scientific result

would accrue, if the Bureau of Labor Statistics were to pick out three or four leading industries, say cotton, wool, boots and shoes, and machinery, and present for each of these a complete annual report, leaving the status of the other industries to be judged by the status of these typical groups. So far as the record went, it would then be a record of growth, and, as an index of business conditions, it would possess decided advantages over the method now in vogue. So far as it went, it would be an absolute standard of measurement; and many of the uncertainties, perplexities, and limitations which continually confront and annoy the student of the present annual reports would be eliminated. While I question the necessity for any annual returns, I believe that if they must be had they should be made in the manner that will make them the most generally useful and the most easily understood. As the reports are now made, they have too many of the characteristics of a mathematical puzzle.

Mr. Wadlin makes it clear that our census methods of reporting manufacturing statistics confound two things which are not at all alike, and the grouping of which in the same series of tabulations is not strictly scientific; — the factory manufacture and the shop manufacture, — as we may call it for lack of a more definite designation. The conditions which govern production in the two are certainly not the same; and we may hope that a time will come when it will be possible to properly differentiate them in both state and federal censuses of manufactures. To so differentiate them appears to be a large part of Mr. Wadlin's plan in this branch of his work. Heartily approving of the idea, the question remains whether his method is the one best adapted to that purpose.

In the first place it is a departure from the purpose for which the annual statistics were originally authorized by the legislature. The law of 1896 under which the annual statistics are taken did away altogether with the decennial census of manufactures. The language of the first report under that law leaves no room to doubt that it was the original intention of the Bureau of Labor Statistics, as well as of the law makers, to make the annual account a complete although abbreviated substitute for the decennial census of manufactures. Mr. Wadlin says that he has not seen his way clear to abandoning the enumeration of the minor industrial establishments, — the shop, semi-professional and hand industries omitted from the annual account; and, hence, when the time came, the decennial census of 1895 was

taken as before. Clearly, therefore, the original purpose of the annual account — to do away with the decennial census — has failed. We are to inquire, then, whether there are other purposes sufficient to warrant their continuance; whether the annual account is a satisfactory presentation of the factory industry as distinguished from the shop industry; and whether there is any secondary purpose served important enough to justify the State in requiring so large a body of manufacturers to make not only an annual report, but, every fifth year, two reports of their year's business.

In the report for 1887 it is stated that the purpose of these statistics is "to ascertain whether or not the volume of production is keeping pace with the past, and to determine our industrial condition from year to year."

The first of these two purposes cannot be satisfactorily accomplished so long as there is a constant variation in one of the main factors of comparison and no record of the actual increase or decrease in that factor. I refer to the number of establishments considered. The comparison of identical establishments, from year to year, determines the relative condition of these identical establishments in the two years. It indicates whether their production has been greater or less in value. Mr. Wadlin adds that an elaborate system of percentages carried over from one year to another will ascertain with close approximation the actual growth of any industry or of all the industries of the State, between any two given years, with a decennial census as a starting point. He apparently demonstrates this by numerous examples, comparing 1885 and 1890, and 1890 and 1895. But these examples are nothing more than curious and interesting coincidences. No percentage calculated upon certain fixed and given things, such as a group of identical establishments, can be a reliable percentage for calculating certain other and different things not within purview. The accidental coincidence may frequently appear; but the procedure is none the less an hypothesis. Mr. Wadlin's figures are based on the assumption that the product of new establishments started in any year, or others discontinued in that year, is directly proportional to the increased product, or the decreased product, of the establishments continuing to do business and reporting to the Bureau. If the figures seem to justify the assumption, it can only be described as an instance of remarkable good luck on the

part of the Bureau; for, in the nature of things, there can be no such actual relationship.

This fact can be illustrated by the cotton manufacture. There is much interest today to know how this industry stands in Massachusetts as compared with its position in 1890. I cannot ascertain from the annual statistics. The relative spindle capacity at the two epochs is not given. The actual number of mills in operation at the two epochs is not given. In the first year reports are presented from 157 mills producing goods worth $90,063,203. In 1896 the reports are for 169 mills producing $87,146,004 worth of goods. These 169 establishments are employing $112,902,817 capital in 1896 as against $115,474,265 employed by 157 mills in 1890. Has the capital employed by our cotton mills decreased by that amount in the five years? From the increase in mills it should have considerably increased. The value of cotton goods made in the State should have increased for the same reason, after making all allowance for the decrease in the market value of goods which has occurred in the interim. On the face of the figures it appears here to be about $3,000,000 less than in 1890. On their face, at least, the figures are misleading, and any attempt to get at the real fact by a resort to percentages of increase and decrease, based upon the returns of a constantly varying number of mills, is hopelessly confusing, uncertain, and untrustworthy. In a word, the statistics do not enable us "to ascertain whether or not the volume of business is keeping pace with the past." The reason why is that there have been a number of new mills established in the State since 1890, largely increasing its producing capacity; what relationship these new mills bear to the problem, in the comparisons between 1890 and 1896, we are unable to determine. In any comparison between the two years, based upon identical establishments, they clearly cannot figure. The difficulty is that in both years we have not an absolute but a relative standard, this relative standard varying from year to year not with the actual variation in the number of mills in operation, but with the variation in the number of mills compared. Percentages in the compilation of which these accidental variations have so much to do are dangerous, to say the least. That Mr. Wadlin himself is of this opinion, I judge from the recent *Bulletin* on the cotton manufacture. The *Bulletin* is an admirable presentation of the statistical status of the Massachusetts cotton industry; but it entirely overlooks the phase of the subject we are

discussing.— the most important phase of all. If Mr. Wadlin could ascertain the fact from the annual statistics, and demonstrate it therefrom, I think he would not have omitted to do so.

The *Bulletin* in question presents from the annual statistics the details of the cotton manufacture of Fall River, New Bedford, Lawrence, and Lowell so far as the office had the returns of identical establishments for the years 1890–1897. They are confined in New Bedford to nine mills, and they indicate that the nine mills in question made in 1897, $9,338,283 in products as against $8,841,869 in 1890. That is interesting and important. But in the meanwhile there were 18 cotton mills in New Bedford in 1897, and the system of comparing identical establishments compels half of them to be left out of the account. In other words, the annual statistics are not *a measure of growth*, and, therefore, they cannot accomplish the first of the two objects which Mr. Wadlin has assigned to these compilations. No system of computation based upon identical establishments, and those only, can be a measure of growth, except as to the growth of those identical establishments.

Nor is it a successful answer to this criticism to say that "the plan of basing conclusions upon a limited number of similar cases is universally accepted in statistical investigation," and to instance the crop returns of the United States. Indeed, the illustration is fatal to this contention. Any estimate of the year's wheat crop, based only upon the average yield per acre, as compared with the average yield of the previous year, would be fatally defective. It must also take equal cognizance of the actual increase or decrease in the acreage. Crop estimates are based upon these two elements. Mr. Wadlin's estimates, which should also be based upon two elements, take cognizance of but one. They compare the relative production of identical establishments, but they take no cognizance of actual increase or decrease in the productive forces of manufacture.

As to the second purpose of these statistics, above stated, "to determine our industrial condition from year to year," the utility of the annual statistics is not so much a statistical as a practical question; and opinions may differ widely. That Mr. Wadlin is convinced of their great practical value I have no doubt. That we can learn some things from them of interest, I admit. Whether the things we learn in comparison with the things we would like to learn but cannot are worth learning every year, is a fair question.

The annual fluctuations reported in the amount of capital employed are of no value or significance. As capital is reported, either to national censuses or the Massachusetts annual reports, it is a valueless contribution to statistical data, including as it does borrowed money and the raw materials purchased with borrowed money, and varying as it must according to the exigencies of the particular period when the report is made. If the returns of capital are valueless, the annual calculation of "percentage of profit and minor expense fund to capital" is valueless; and the variations in this percentage which occur from year to year are of no moment or statistical significance.

Variations in the value of gross product from year to year are due wholly to two causes: first, variation in quantity of output; second, variation in market value of output, *i. e.*, prices. The annual statistics of Massachusetts take cognizance of neither of these two elements. To actually accomplish the purpose of showing "the trend of business from year to year" they must necessarily take cognizance of both. The "trend of business" can only be statistically shown by showing the relationship of volume and value from time to time. Since the annual statistics cannot do this, in the nature of things, we question the practical utility of an annual report on the part of the State showing value alone; because value alone cannot accomplish the end sought, and the items omitted are the elements whose presence is absolutely necessary to form correct conclusions from the figures which indicate value.

This criticism applies equally to many of the subsequent calculations made in the summary analyses of the reports.

The value of the "stock used" varies from year to year, not simply with the output of goods, but with every fluctuation in the prices of raw materials.

The "industry product" varies in value in keeping with the variation in prices of two absent elements, *viz.*, the prices of goods and the prices of raw materials; and the percentage figures of the reports are thus vitiated from both ends.

When we come to "the relationship of wages to value of gross product" we have a series of fluctuating percentages which are assumed to indicate what proportion of the total value of the proceeds of industry goes to the wage earners in each year as compared with the prior year, but which in reality do nothing of the kind. The fluctuations are sometimes quite wide; in the cotton manufacture

they vary from 55.41 per cent in 1888 to 70.19 per cent in 1896; and as between the several industries they vary (in 1896) from 47.52 per cent in paper and paper goods to 70.19 in cottons. These percentages of course largely depend, as between the different industries, upon the relative cost of the raw materials employed to create a given product. Their variations are chiefly determined in identical industries by the varying prices of raw materials and finished goods. Their significance it is hard to see, and their only effect must be to mislead. They are not in any way indicative of a change in wages. They do not prove a larger or smaller margin of profit, because they are based upon too many elements of variation. They can indicate nothing which throws any light upon "the trend of business" or the relations of labor and capital, or anything whatsoever. They may possess a certain interest for the curious, but their calculation and presentation year after year, as though they were in some sense a factor in reaching definite conclusions as to business conditions, or were of intrinsic statistical or sociological significance, is not only not justified, but ought, in my judgment, to be condemned and stopped, as tending to promulgate error. Any theory of business conditions, either by the business man or the statistician or the doctrinaire based upon these annual fluctuations in the percentages of "industry product paid in wages," is certain to be misleading, because they have no relationship to any causes or conditions of which the report takes cognizance.

It would be easy if it were worth while to carry these criticisms to many other similar calculations and percentages contained in the annual statistics. Enough has been said to show that the annual statistics (1) are not a substitute for the decennial census of manufactures; (2) that they are not a safe measure of industrial growth; and (3) that they are not a true guide to "the trend of business." In asserting all this, I do not wish to be understood as denying that interesting and important facts are brought out in these annual reports; but I raise the broad question whether the State of Massachusetts has adopted the best method of rectifying the criticism upon decennial censuses of manufactures, which springs from the fact that one may be taken at a period of great prosperity and another at a period of great business depression, and comparisons between the two may thus be greatly misleading. The true remedy, I believe, is the quinquennial census of manufactures by the state or the nation,

or by both in coöperation. Intervals of five years are sufficiently close together to meet the criticism above mentioned. Five-year periods are as frequent as it is necessary or desirable to gather such statistics. The fluctuations that occur in wages, in numbers of employes, in product, when measured by five-year periods, will accomplish all the statistical, economic, and sociological purposes which the Government has in view in authorizing this class of investigations. Mr. Wadlin says that there is a constant and increasing demand for *present* data on all these points. I agree with him as to the importance of early availability for such statistics. But I believe him entirely mistaken in supposing that there is any real advantage to knowledge, to society, or to industry in serving them up every year and thus indefinitely multiplying the points of comparison. There is as much danger of too many statistics as of not enough. They may become confusing, perplexing, and superfluous.

To secure the highest utility for the statistical work of the Bureau, Mr. Wadlin might well consider the advisibility of substituting for the annual reports a new five-year inquiry midway between the decennial censuses, and confined to the actual manufacturing establishments of the State as contrasted with the shops. He informs us that he has already so systematized his work that it would be possible to make exact comparisons with the similar establishments reported in the larger work. From such five-year censuses it would be possible to measure the actual industrial growth of the State, abandoning all this elaborate series of percentage measurements, and comparisons of identical establishments, and presenting all the data regarding wages, product, etc., which is now repeated annually, in a manner that would amply satisfy the requirements of statistical science and sociological inquiry.

S. N. D. North.

Boston, Mass.

REVIEWS AND MISCELLANY.

THE WORKMAN IN BERLIN.

Recent statistics on the condition of the working classes in Berlin, published by the director of municipal statistics, are reviewed by A. Raffalovich in a March issue of *L'Economiste Français.* The number of laborers or salaried employes of both sexes has increased out of proportion to the increase in population. In 1800 there were about 30,000 employes in Berlin; in 1816, of a population of 182,800, there were 43,700 laborers, using the word in its broadest sense; in 1846, of 390,000 inhabitants, 96,500 were laborers; in 1895 the city had a population of 1,678,000, and 320,000 male and 185,000 female wage-earners. Estimating per thousand inhabitants, the proportion of wage-earners stands as follows: —

	Laborers.	Domestics.
Berlin	524	38
Dortmund	637	27
Aix-la-chapelle	557	35
Dusseldorf	552	36
Leipzig	517	31
Frankfort	432	33
Strasbourg	419	38

According to the census of occupations of 1895 there were in Berlin 18,000 locksmiths, 6400 shoemakers, 19,512 cabinetmakers and joiners, 17,000 workmen in building trades, 13,000 masons, 3200 painters, 10,200 printers, 9400 tailors, 3800 tailoresses, 25,000 seamstresses, 8100 laundresses, 11,254 male and 9873 female servants in hotels, 7171 male and 59,918 female domestics.

The housing of this great laboring class, and of the poor, has long been an object of attention in Berlin. As early as 1796 the dangers of poor ventilation and general unwholesomeness were noticed, while in 1844 an agitation was raised which has continued to the present day. In 1861 there were, on an average, 48 inmates to a tenement house, 57 in 1871, and 73 in 1890. The average annual rent, in marks, has been: —

	1880.	1885.	1890.
Per room	221	235	248
Per inmate	119	122	127

The share of rent in the cost of living is evidently increasing. A characteristic feature in the lodging of the population of Berlin is the large number of "furnished rooms" for night-lodgers. In 1890, 56 per cent of the families had one night-lodger; 29 per cent had two, and 10 per cent three. Some districts of Berlin are densely populated. A private investigation of 781 houses, undertaken in 1893, to ascertain the pecuniary return from the rental of a cubic meter of air, proved it to be in 75 per cent of the cases from two to three marks a year. Various efforts have been made to improve sanitary conditions. In 1848 there was organized in Berlin, under the name of *Berliner gemeinnutzige Baugesellschaft*, a society for the purpose of constructing sanitary dwellings at low cost and of aiding the occupants to become owners. At the end of 1895 this society had 59 buildings with 580 tenements and 1906 tenants. The rent varies from 100 to 500 marks a year. The Berlin Building Association was formed in 1886 with the particular aim of building cheap homes in the suburbs for workmen. The entrance fee is two marks, the shares 200 marks, contributed in weekly payments; the dividend paid is five per cent. This society has 809 members, and had in 1895 built 149 homes, of which 75, with a total value of 1,120,266 marks, mortgaged for 670,500 marks, had been deeded to members. There have been various other attempts along the same line and several other societies formed, of which the *Deutsche Volksbau Gesellschaft* and the *Berliner Spar und Bauverein* may be especially mentioned.

The death rate in the districts where the workmen live is high. This is due to the great number of births and the excessive mortality among new-born infants. In the well-to-do and rich quarters of the city the mortality of new-born infants is from 148 to 192 per thousand, but in the poorer districts it rises to 346 per thousand. It is quite difficult to obtain statistics as to illness in the laboring classes. The following table from the *Gewerkskrankenverein* may give some idea of the amount: —

	1892.	1895.
Average number of members	285,644	92,053
Illnesses	199,461	93,186
Per cent of sick	97	101
Injuries	13,192	5,892

The mortality from tuberculosis is enormous, one-fourth of the deaths of males and one-third of the deaths of females being due to this disease. Dr. Sommerfeld attributes 60 per cent of the deaths

among cigarmakers to diseases of the lungs; among painters, 55 per cent; printers, 44 per cent; bookbinders, 57 per cent; masons, 38 per cent; and 29 per cent among butchers.

In Germany compulsory insurance is one of the most important measures adopted for the protection of the workman. The municipal authorities in 1850 introduced compulsory insurance against illness for the employes of stores and manufactories in Berlin. The men were obliged to subscribe to a benefit fund. In 1854 these benefit funds numbered 74 with 34,460 members, and assessments of 675 thalers from the employers and 86,318 thalers from the employes. The statistics of benefit funds in 1895 were as follows: —

	Local Funds.	Funds of Manufactories.	Funds of Societies.	State Funds.	Free Funds.
Funds	59	29	18	2	36
Members, male	209,185	35,752	17,903	19,083	19,222
Members, female	96,051	4,247	4,930	1,224	7,059
Receipts	m. 8,841,977	m. 1,263,236	m. 472,316	m. 460,090	m. 646,184
Expenses	m. 8,460,890	m. 1,213,588	m. 436,871	m. 459,639	m. 604,882
Physicians' fees	774,330	157,828	34,000	79,000	65,975
Drugs	994,031	163,000	41,303	62,000	58,744
Indemnities	2,676,698	527,226	118,853	210,343	221,000
Days ill	2,682,000	401,301	133,515	125,309	154,965

About 415,000 persons are insured against illness, and 539,000 against old age and disability. For the latter 5,429,000 marks in assessments has been contributed, 580,000 marks paid in pensions, and 105,000 marks returned to women who have married. Over 200,000 workmen are insured against accidents, the building trades furnishing about a fourth of that number. There are from 4000 to 5000 accidents annually. Ten medical stations with beds have been provided so that immediate attention may render the period of incapacity as short as possible.

Since 1870 Berlin has provided free instruction in the primary school grades. In 1896 there were 147 communal schools with 190,462 pupils, comprising two-thirds of the children of Berlin, at a total expense of 10,500,000 marks, or 56½ marks per child. The course includes four hours each of religion, writing, reading, and arithmetic, and two of history, geography, natural history, geometry, drawing, singing, and gymnasium. A strong effort has been made

to put supplementary courses within the reach of wage-earning children by evening and Sunday instruction.

Another feature of advantage to the workman is the inspection of factories. This was carried out in 1895 by a chief-inspector, three assistant inspectors, and four deputies. There were 4770 establishments with 150,238 workmen, of whom 104,000 were males above 16, 37,416 women, 4754 youths between 14 and 16 years of age, and 3351 young girls. Half of these establishments were inspected, but a good part of the investigation was limited to an inspection of the steam boilers. One of the chief duties of the inspector is to be a mediator between employer and employes, that is, an instrument of reconciliation. Each Friday evening, and twice a month on Sunday, he must be at the disposal of the employes who wish to consult him, but the number who do so is not large.

The industrial tribunal (*Gewerbegericht*) before which cases between employer and employe are tried has been in operation several years. The judges are named by the city and are assisted by elected deputies consisting of an equal number of employers and employes. In 1893 the employers brought complaint in 356 cases only; in 1894, 216; and in 1895, 386. The greater part of the cases are concerned with law suits for the payment of wages or indemnity for dismissal. Forty per cent of the suits were terminated by reconciliation, 19 per cent by the withdrawal of the plaintiff, 13 per cent by default.

Berlin has an attraction for the people of the provinces, not only, as is often believed, on account of the pleasures of city life which it offers, but even more by the seemingly superior opportunities for work and higher earnings. Consequently there has been an enormous influx of provincials to the capital, who, upon reaching the railway station, become at once a prey to the solicitors of employment bureaux. These bureaux demand a high commission, and their proprietors make large profits. One class of employment bureaux consists of agencies established by the employers, as, for example, the bureau for metal workers, which in 1896 found situations for 21,281 men. The workmen on their part have also organized labor exchanges. In the brewing trade there is a bureau administered jointly by four emyloyers and four employes. Enrollment costs 20 pfennigs, and in case of obtaining a situation the applicant gives six marks and and the employer three marks to an aid fund. In 1896, 5000 marks

were laid aside, 2200 marks spent, 1709 men placed in permanent and 2372 in temporary situations. In 1883 a central employment association was established by private initiative, which, in coöperation with the municipal authorities, found places in 1896 for 11,318 coachmen, day-laborers, etc., 4630 painters, 1483 locksmiths, 1300 plumbers, 155 masons, and 1662 women. The newspapers gave valuable assistance either by gratuitous insertion of "wants" or by the free distribution of leaflets containing offers of employment.

Hirschberg's figures on the wages of unskilled labor show that Berlin ranks with Frankfort and Hamburg: —

	Adult Males.		Adult Females.	
	1884.	1892.	1884.	1892.
Berlin	m. 2.40	m. 2.70	m. 1.50	m. 1.50
Aix-la-chapelle	2.00	2.10	1.20	1.40
Breslau	1.60	2.00	1.00	1.10
Elberfeld	2.40	2.40	1.50	1.50
Frankfort	2.40	2.50	1.70	1.80
Hamburg	2.50	3.00	1.85	2.00
Cologne	2.50	2.50	1.50	1.50

The skilled workman is of course better paid. Omnibus drivers and others engaged in transportation earn from three to five marks per day. Wages of tailors are not so good, since the men earn only 12 to 15 marks a week, and the women finishers 8.50 to 15 marks a week. The nominal wages of domestic servants are little higher, but they are lodged and fed.

	Lowest.	Medium.	Highest.
Maid of all work	m. 135	m. 165	m. 240
Child's nurse	105	150	180
Cook	180	210	300
Sick nurse	240	300	360

Counting living expenses at 1 mark per day these wages are comparatively good.

ALICE RHINEHART CALLAWAY.

GOLD IN ACTUAL CIRCULATION.

The following letter from the Secretary of the Treasury, under date of April 18, 1898, relates to the amount of gold in actual circulation, method of computation, and the amount of United States paper money which will never be presented for redemption: —

Sir: — I have the honor to acknowledge receipt of Senate resolution dated the 5th instant, as follows: —

RESOLVED, That the Secretary of the Treasury be directed to inform the Senate how he ascertains the amount of gold in actual circulation, after deducting the reserves in the Treasury and in the banks, and if he has any actual statistics upon which to base his statement; and also to inform the Senate whether he makes any allowance for the wear and loss of the paper circulation of the Government in his Treasury statement, or does he assume that there is no diminution of the amount of paper money in circulation by reason of wear and loss.

In reply the Senate is respectfully informed that the starting point of the estimate of the stock of gold in the United States is the calculation made of the stock June 30, 1872, by Dr. Henry R. Linderman, then Director of the Mint. At that period there was no gold in active circulation in the United States (except on the Pacific coast), and the estimate comprised only the metallic stock in the Treasury and national banks, with an estimate of $20,000,000 as a minimum in use on the Pacific coast, and an allowance of $10,000,000 for that in State and private banks and private hoards. Dr. Linderman's aggregate was $128,389,864.49. The estimates from year to year since 1873 have been arrived at by adding to the stock of coin at that date the annual coinage and amount of domestic coin imported, deducting the loss by recoinage of United States coin, the amount exported, and estimated as used in the industrial arts.

The amount exported and imported is obtained from the custom-house officials at the ports of entry, except what may be taken out or brought in by individuals in their private possession. That would be small, and the outgo and income are assumed to offset each other, as parties going abroad or returning usually convert their pocket change at the point of departure or on arrival.

The estimate of the amount used in the industrial arts is based upon several censuses made by the Bureau of the Mint and upon

annual reports received from private smelters and refiners. Manufacturing jewelers, doing any considerable business, prefer to buy refined bars rather than use coin, because by so doing they get full weight while by using coin they lose by whatever amount the coin is abraded. The coin melted down by refiners is usually mutilated or under weight, and bought by them at its bullion value. The amount of coin melted down by small manufacturers is estimated from the returns obtained by circulars sent to all the jewelers in the United States whose names appear in directories.

It is not believed that any officer of the Government has assumed that there is no diminution of the amount of paper money in circulation by reason of wear and loss, but the official reports published by the Department from time to time contain no allowance for such loss because there is no authority of law for making any reduction, on that account, of the stated liabilities of the United States. The subject has been considered from time to time and estimates have been made of the probable loss, the latest of which, recently made by the actuary of the Department, is as follows: —

ESTIMATE OF THE AMOUNT OF UNITED STATES PAPER MONEY THAT WILL NEVER BE PRESENTED FOR REDEMPTION.

Kind.	Total Issued, Including Reissues.	Amount Outstanding.	Estimated Loss.
United States notes	$2,854,525,808	$346,681,016	$5,488,900
Treasury notes of 1890	371,073,000	114,867,280	55,770
Gold certificates	1,506,039,300	38,782,169	207,600
Silver certificates	1,426,790,000	375,479,504	711,800
Currency certificates	1,380,250,000	62,340,000	.....
Summary of United States issues	7,538,678,108	938,149,969	6,464,000
National bank notes	2,064,079,225	230,016,225	6,581,300
Total	9,602,757,333	1,168,166,194	13,045,300

Respectfully yours,

L. J. GAGE, *Secretary.*

THE PRESIDENT OF THE SENATE.

IMPORT AND EXPORT VALUATIONS.

The following letter, dated London, May 25, 1898, is taken from *The Manufacturer*, June 4: —

The Manufacturer for April 9th (page 16) contained a very interesting article on the difference in the official value of our exports to France, as shown in the Washington returns, and the French value of our imports into France, as shown in the French official statistics. Two samples will show the gist of the writer's contention: —

	French Statistics.	American Statistics.
1896	$60,335,946	$53,343,571
1897	84,038,269	73,665,199

The above are the values of the American exports to France, and the French customs officials' value of French imports from United States. The discrepancies are at once apparent.

The imports from France into United States, as shown by Washington, and France's exports to United States, as shown by the French authorities, are as under: —

	French Statistics.	American Statistics.
1896	$43,214,520	$55,694,541
1897	47,347,115	66,730,631

Here again we have a radical error, although where it is located is a difficult matter to say. Much the same result is seen from an examination of the British trade returns. Of course exports should have a higher value when landed at their destination; costs, freightage, and other expenses being added. Under these circumstances I have laid the matter (so far as British statistics are concerned) before the chief of the English Customs Department, and this is his explanation: —

"It has always been found impossible to establish a correspondence between the United States exports to this country (England), as given in their returns, and the British imports from the United States, as given in our returns. The reasons for this disagreement are numerous. In the first place it would be necessary, if both sets of figures were to correspond, that the terminology of the two countries should be identical — that is to say, that both countries should attach exactly the same meaning to the same words and

expressions in their several imports and exports lists. Thus, as regards the iron and steel manufactures, the British heading of that category does not include hardware, agricultural implements, machinery, printing presses, typewriters, etc., most of which apparently fall under the United States heading of 'iron and steel,' while the sum mentioned as the British total does not include the value for sewing machines.

"And then," continued the British statistical expert, "there is another reason for these discrepancies — the British returns are classified according to the countries whence the goods are immediately imported. In this way it is undoubted that goods really of United States origin are classified as from Canada, and *vice versa;* in the winter season when Canadian ports are closed the goods of that Dependency are imported into England as from the United States.

"The system we adopt in England is a valuation of both imports and exports according to the bills of entry and the shipping bills, false declarations being punishable by fine. In the case of imports, the control of the customs administration, at least in so far as regards those articles which are subject to duty, is a guarantee of accuracy in the returns; but as regards the exports it is different, for merchants are only required to furnish their declarations within a period of six days of the sailing of the vessel, and the only proof of their accuracy, if proof be needed, lies in an inspection of the bills of lading, the production of which the authorities have the right to demand.

"The valuation of imports and exports is checked in the statistical office of the Customs (to which a copy of the entry is sent), where the officials possess a knowledge of the current values and where market reports and lists of prices current are readily available to detect any departures from substantial accuracy in this respect. Practically, it will be seen that the important difference between the United Kingdom and other systems is that the English method shows the values at the time of import and export, while in most other countries the values are computed at the prices of a year or more before.

"For goods imported the practice adopted is generally to take the value at the port of entry, including all incidental expenses up to landing on the way. For goods consigned to the English market for sale, the market value in England is that which is sought for and which is included in the returns. This is ascertained from the dec-

laration made by the importers, and is checked by the expert knowledge available in the statistical office already mentioned. For the exports, the value at the port of shipment is taken. English statistics take cognizance only of the immediate port of origin and destination, and do not record the prime origin and ultimate destination of the goods.

"And, then, too, there is another cause of divergence between the returns of any two countries. I allude to smuggling. There is known to exist a good deal of this trade on certain frontiers, and this is carried on to such an extent as to seriously falsify the customs returns."

I may mention that in the opinion of the Chief of the British Customs House there is no reason to doubt the substantial accuracy of the English returns, nor does he think the declarations are untrustworthy. At the same time there appears to be something quite wrong in the systems, not only of England but of France and other countries, which permits of such large discrepancies as have been pointed out in this article.

F. C. CHAPPELL.

STATEMENT OF DEATH RATES.

The following letter was sent by the office of the Division of Vital Statistics of the Department of State of Michigan in reply to an inquiry from Detroit. A paragraph relating to the filing of the certificate has been omitted.

The death rates for Detroit as printed in the *Bulletin* have been worked out with great care, and you may rely on them as entirely correct on the basis of the transcripts furnished by your office. For the month of November you reported to us 265 deaths, including 21 still-births, as occurring in the city of Detroit, and the annual rate based on this number of deaths and upon the estimated population of Detroit on basis of average annual increase between the United States census of 1890 and the State census of 1894 was 12.4 per 1000. You state that the number of deaths during November was 254, exclusive of "still-births, premature births, and bodies which have died in the city which were not residents of Detroit," and upon this number and an estimated population of 275,000 you obtain a

rate of 11.24 per 1000. It will be useful to consider the causes of this discrepancy, as the official death rates issued by the city and State authorities ought to show absolute agreement.

The difference in the death rates might arise from: (1) Difference in the number of deaths reported in the month; (2) difference in method of computing or stating annual rate; or (3) difference in the estimate of population.

(1) The difference in the number of deaths serving as a basis for the rates depends upon four considerations, namely: (*a*) Inclusion or non-inclusion of still-births; (*b*) inclusion or non-inclusion of premature births; (*c*) inclusion or non-inclusion of deaths of non-residents; (*d*) inclusion of tardy returns coming in at the beginning of the following month, and after the transcripts have been sent from your office to Lansing.

(*a*) The *Bulletin* includes still-births in all statements of the death rate. This is implied by the placing of still-births as a special column in all of the tables, in connection with ages, and was explicitly stated in the September *Bulletin*, page 3. As to the propriety of including still-births in the total death rate, there may be a difference of opinion. Authorities may be found on either side. We follow at present the usage of the *Michigan Registration Reports* since 1867, a usage which is shared in by many other registration offices. The European classifications generally group still-births in a distinct class, apart from deaths. The United States census includes still-births in deaths in the general tables. I may say that Mexico and the Province of Quebec, which have recently adopted an approved European form of classification (the Bertillon system) have both placed still-births in the tabular list. While on theoretical grounds it seems to me that the establishment of a separate class for still-births is desirable, with consequent exclusion from the general death rate, unless qualified, I am not at all sure that this would be best for Michigan. It is very important that all still-births be registered, and the best way at present to secure this is to treat them in all respects like other deaths. It might be well to present two alternative statements of death rates, as we have in the *Registration Reports* for some years, giving them inclusive and exclusive of still-births.

(*b*) I do not think that you are justified in excluding premature births from deaths. None of the standard classifications does so.

See any English Registrar-General's report, or, for the Bertillon system, the *Tableaux Mensuels* of Paris. In the latter, as stated in the explanation of terms contained in the *Annuaire Statistique* for 1888, premature births are contained in title 139, "Congenital debility, icterus and sclerema." This is the classification recommended by the Committee on Nomenclature of the American Public Health Association at the last meeting at Philadelphia, and in the report of the committee as given in the *Journal of the American Medical Association* for November 27, 1897, special reference was made to this point.

(*c*) Neither do I think that you are justified in leaving out of your death rate any deaths of persons who are not residents of your city. The question here is analogous to that of the census, whether a *de facto* or a *de jure* enumeration is preferable. We must choose one or the other method, and as the law at present exists we are obliged to base our death rate on the deaths that actually occurred in a district, without regard to the possible residence of the decedents. You will see that to do otherwise would be to understate the true number of deaths, for while you could exclude deaths of non-residents from the Detroit mortality, you could not include the deaths of residents of Detroit occurring in other parts of the State or in other States or countries. It is not fair to exclude one and not to include the other, and especially such deaths as might occur of invalids removing from Detroit to the West or South, and who die and are buried there.

. . . . . .

(2) Our methods of computation are practically identical. For convenience we multiply the total deaths by 12.2 for 30-day months, or 11.8 for 31-day months, thus converting the monthly deaths to the basis for an annual rate, and divide by the estimated population.

(3) We differ slightly in our estimate of population. As stated in the *Bulletin* all rates are based on populations estimated by average annual increase from the censuses of 1890 and 1894. There are two principal methods of estimating population, the geometrical and the arithmetical. I have shown for Michigan that the latter is theoretically and practically preferably (the same may be demonstrated for many other States in this country), and I have therefore employed it for Michigan as a whole and for several subdivisions,

including Detroit. Now any uniform system of estimation whatever will work an occasional injustice, but probably less on the whole than the use of census populations for former years (no estimates) or purely arbitrary guesses. Any rates based on directories, school censuses, and the like, have little or no statistical standing. I do not know by what method you obtained your assumed population (275,000), but it differs but little from the population used by me as stated above, namely, 261,740. Beginning with January, our rates will be based upon an estimated population for Detroit of 269,720. These differences are probably within the reasonable limits of accuracy of estimation, and make a difference in the rates of about .5 per 1000. In all cases we state rates to the first decimal place only, as to give the second implies an accuracy which few registration offices can lay claim to. We add .1 for the second place of decimals omitted, if .05 or over.

CONSTITUTION

OF THE

AMERICAN STATISTICAL ASSOCIATION.

ARTICLE I. This Association shall be denominated the AMERICAN STATISTICAL ASSOCIATION.

ART. II. The objects of the Association shall be to collect, preserve, and diffuse statistical information in the different departments of human knowledge.

ART. III. The Association shall be composed of Fellows and Honorary Members.

ART. IV. All members shall be chosen by the Board of Directors, the affirmative votes of four-fifths of the members of said Board being necessary to a choice. Each fellow shall pay annually two dollars, or twenty dollars at some one time.

ART. V. Fellows only shall be entitled to vote, but Honorary Members shall have the right to sit and deliberate in all the meetings of the Association.

ART. VI. The officers of the Association shall be a President, five Vice-Presidents, a Recording Secretary, a Corresponding Secretary, a Treasurer, a Librarian, and three Counselors, who, together with the President and Secretaries, shall form a Board of Directors for the government of the institution, three of whom shall constitute a quorum at any meeting regularly convened. There shall be also three Standing Committees of three members each, namely, on Publication, on Finance, and on the Library.

ART. VII. The Association shall meet in the city of Boston, on the third Friday in January, April, and October, and at such other times as the Board of Directors shall appoint. At the annual meeting in January, the Association shall hear reports of the Board of Directors, of the Treasurer, of the Librarian, and of the Standing Committees, elect officers, and transact other business. Vacancies may be filled at any regular meeting. Five members shall be necessary to form a quorum for transacting business and the election of members, but a less number may adjourn the meeting.

ART. VIII. No alteration in this Constitution shall be made except on notice at a previous meeting, and by a vote of three fourths of the members present.

NOTE.— Each member shall be entitled to receive all reports and publications of the Association.

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